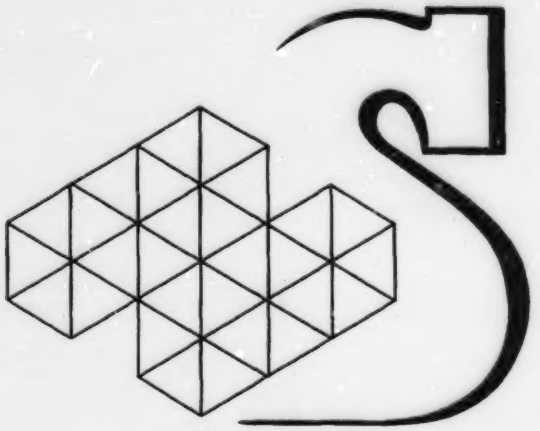

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Soldiers Day Database

Data Management Plan

Contract No. W7711-92-7151-05

21 June 1994

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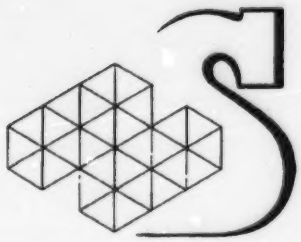

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Executive Summary

This document sets out the approach to be taken to first framing and then gathering data on the equipment, weapons and clothing used and tasks performed by an infantry rifleman in the Canadian Army, and subsequently other army personnel, for inclusion in a multi-media CD-ROM data base.

1. Background

Designers and developers of products for the Department of National Defence (DND) sometimes lack insight into actual operational conditions, military organization or soldier tasks for which their product will be used. As a consequence the needs of personnel using, operating or maintaining the weapon, clothing or equipment are not met as effectively as possible. To meet this deficiency, a CD-ROM IBM PC based multi-media software database has been proposed to provide designers, researchers and military project managers within DND and potential contractors with information about:

- Characteristics of in-service clothing, equipment and weapons.
- Typical tasks undertaken by soldiers in different military roles.
- The organizational structure of military units.

The proposed data base would provide a user friendly search capability to browse unit organizational diagrams; task descriptions; pictures and technical descriptions of equipment, clothing and weapons; concerns with in-service items (where known); references to technical studies and field trials; photographs or video clips of representative tasks; and a glossary of common military and technical terms. Users of the data base will be able to clip relevant items to other windows applications for their own use.

Details of the Soldiers Day database structure as well as software and hardware specifications are provided in a separate report.

2. Objectives

The objective of this Data Management Plan is to set out:

- Data Acquisition: approaches to be taken to gathering initializing data.
- Data Updating: approaches to be taken for adding or updating data.

3. Scope

The Soldiers' Day data base will be a read only CD-ROM data base containing multi-media information about operational and training tasks undertaken by different categories of personnel in the Canadian Forces and the conditions under which they are likely be performed. The purpose of this data base is to provide access to realistic information about the demands placed on individual soldiers by their day to day duties for use by personnel involved in the specification, development, design, research and procurement of clothing and equipment. Priority has been given to information relevant to the defined research priorities of the Integrated Protective Clothing and Equipment project and identified problem areas.

Research areas include:

- Load carriage and load rationale.
- Ballistic and environmental clothing.
- Hand, foot and head wear.

4. Limitations

The following limitations apply.

- Human factors information already available in other guidelines will not be repeated. Relevant documents or guidelines will be referenced for the user but not provided. For Version 1.0 of the software references to technical studies (field trials, etc.) only will be supplied. In later Versions data from such technical references may be included if considered desirable.
- For Version 1.0 data gathering will be limited to information about the dismounted infantry rifleman.

5. Priorities

Priorities for data gathering methods are:

- **Cost effectiveness:** Maximum use must be made of existing data.
- **User Relevance:** Data must be relevant to intended data base users.
- **Operational Relevance:** Data must be relevant to operational requirements of DND (and related training).
- **Realism:** Data must represent actual tasks under likely operational conditions.

Data will be gathered to cover several knowledge domains and presentation formats. Each domain and format is discussed in greater detail below.

Potential knowledge domains include:

1. Common tasks and their component activities undertaken to complete likely missions. Examples of tasks might include road blocks, sentry, advance to contact. Examples of activities might include marching, digging, searching vehicles, observing.
2. Environmental conditions related to climatic, ballistic and NBC conditions.
3. Generic missions that have or may be assigned to Canadian Forces (U.N. peacekeeping, territorial surveillance, NATO, etc).
4. Human factors studies for any given task or item of clothing or equipment in terms of issues such as compatibility, usability, durability, maintainability, etc.
5. In service equipment items, their characteristics and the activities involved in their use.
6. In service garments, their characteristics and the activities involved in their use.
7. In service weapons, their characteristics and the activities involved in their use.
8. Military and human factors terminology.
9. Organizational structure of different arms and units, numbers of personnel.
10. Supplies carried by soldiers to service themselves, their tasks, weapons and equipment.

Certain knowledge domains may need to overlap. For example weapon related tasks and activities may be derived from information about weapons, or missions and tasks, or supplies (ammunition). The data base structure is expected to permit flexibility of navigation according to the needs of individual users so that such overlaps may be approached in several different ways according to user preferences. Information about sources for these different knowledge domains will be required.

Some of information may be embedded into the menu structure of the data base. Other information may be accessed only when certain menu items are invoked.

Potential presentation formats include.

1. Tables
2. Graphs and histograms
3. Icons
4. Still photographs (colour, and black and white)
5. Film or video clips at varying frames/second
6. Diagrams
7. Charts (organizational and flow charts)
8. Text in several forms (alphanumeric listings, technical references, descriptive text from reports or diaries, key words, numerical information, highlighted information)

6. Requirements

Several data management challenges exist for both data initialization and data continuation phases. These include, in alphabetical order:

- **Confidentiality**
  Data in the data base must be screened to ensure that either in isolation or together, the information it contains does not constitute a security violation. In the event that the data base as a whole acquires a security classification, then distribution and recovery of individual copies of the data base may need to be systematized.
- **Conversion**
  Data selected must be converted into a common data base format for the medium in question (e.g. a common graph form, a common video clip form)
- **Entry**
  Data selected must be entered in the data base.
- **Expansion**
  As experience of users with the data base grows, the data base may need to be expanded to hold other categories of information, or more detail for existing categories. For example, initial plans are to complete the data base for the dismounted infantry rifleman. Subsequently, the data base will be expanded to include other Arms (artillery, engineers, etc.).
- **Flagging**
  Data with the potential for cross referencing within the data base to more than one topic must be flagged.
- **Prioritization**
  Data acquisition and entry must be prioritized according to the level of detail and compatibility with IPCE thrust areas.
- **Screening**
  Available documents and visual material must be screened to select relevant items.
- **Standardization**
  Data for different data sets within the data base must be entered consistently now and in the future. This requires a data entry manual and check list for data entry.
- **Updating**
  As new information becomes available on priorities, tasks, equipment etc., existing categories within the data base must be systematically upgraded.
- **Validation**
  Data selected must be checked to ensure that it represents operational realities and priorities.
- **Verification**
  As the data base grows, data base integrity will need to be checked. This is beyond any manual capability and an add on module will need to be built.
- **Weeding**
  Data in the data base must be checked periodically for relevance and accuracy. Out of date information must be removed and, if possible, replaced.

In the light of these requirements, once Version 1.0 is completed it is likely that there will be a requirement for a small data management team of 1-2 persons.

7. Data Acquisition Approaches

As data acquisition commences, the data base may be visualized as an array of empty cells arranged according to the major knowledge domains outlined in Section 4 above. Information to fill these cells will then be drawn from several sources. Predominant among these sources are:

- Existing documents
- Knowledge of Subject Matter Experts (SMEs)
- Observation and measurement during training or operations.

The general approach will be to make as much use as possible of existing documents and SMEs to establish listings of relevant clothing (etc.), unit organization, doctrine and the mission, task, activity relationship for the dismounted infantry rifleman before employing direct observation and measurement to detail task demands.

7.1 Sources of Information

7.1.1 Existing documents, photographs, video or film clips

There is already available within DND or elsewhere copious sources of information which will require identification, screening, validation and conversion for entry into the data base. Existing visual material may be supplemented by material gathered during operations or exercises specifically for inclusion in the data base.

- **Documents** may comprise definitions of terms, descriptions of policy, doctrine, missions or tasks, unit organizational charts, lists and serial numbers of clothing or equipment, excerpts from operational or exercise diaries, trial reports, equipment or training manuals, manufacturers technical material, deficiency reports, etc.
- **Photographic** materials may come from existing documents, archival libraries in DND or units records.
- **Film or video** material from the DND film library.

7.1.2 Experience of soldiers

One of the best sources of information about soldiers tasks and the demands placed on the soldier and his or her clothing, equipment and weapons under operational conditions will be soldiers who have themselves performed those tasks under those conditions. In the past gathering, collating and reporting of such direct experiences has sometimes been selective and idiosyncratic. While all sources of bias cannot be entirely eliminated from any data form, potential sources can be controlled systematically sampling a representative cross-section of the available experience and checking the data for validity and reliability.

7.1.3 Direct observation of operations or training.

In principle the acid test for validation is detailed direct observation of soldier behaviour and use of clothing, equipment on operations. However this will be expensive, time consuming and, even under the best of circumstances, selective and difficult to control in the scientific sense of the word.

Much the same comments apply to data gathering during training exercises with the added disadvantage that training exercises seldom represent 100% operational reality for reasons of meeting

training objectives and limitations of time and resources. However, there is the potential to set up well focused, small scale data gathering exercises to validate critical information or to fill carefully identified gaps in existing knowledge. If units realize that collaboration in such an exercise serves their own training objectives and could gain them access to desirable training resources such as ammunition, training pyrotechnics and other resources, then the essential factor of willing unit cooperation will be much more likely to be gained.

Direct observation may be assigned two roles:

- ***data validation*** for information acquired from documents and SMEs.
- ***data acquisition*** for information unavailable from documents and SMEs.

7.2 Data gathering

Several approaches will be combined in an iterative, complementary manner.

7.2.1 Existing documents

Existing documents will have to be identified, acquired, reviewed for relevant data, and the data entered into the data base. Relevant documents will be identified by systematically interviewing a cross section of SMEs. A small data base team will review the documents and extract relevant data for inclusion in the data base.

Technical information such as field studies related to different clothing or equipment items will be obtained by undertaking a literature search in relevant bibliographic data bases through DSIS. A similar search will be undertaken for photographic or video material within the DND film library based on the identification of rifleman tasks. The output from the film library search will be reviewed using the focus group approach outlined below.

7.2.2 Focus Groups

It is intended to use focus groups of SMEs extensively to acquire information about operational conditions. A representative example of the approach is outlined below.

Data objective: To determine a representative description of typical tasks and activities (and their duration, frequency, intensity, etc.) for a rifleman within an infantry battalion on U.N. operations in Cyprus (or defensive operations in Germany, or Northern surveillance operations in Northern Canada, etc.).

1. Choose a focus group from one infantry battalion of approximately six experienced and articulate officers and senior NCOs with relevant experience. Allocate one full working day.
2. Assemble baseline information requiring confirmation such as battalion ORBAT, clothing and equipment lists, etc.
3. Send outline information to each participant ahead of the focus group for review and comment at the beginning of the day.
4. Structure day of small group discussions to derive task listings, ORBATs, probable equipment, weapons and clothing, and detailed descriptions of high frequency or high load tasks, using the U.N. in Cyprus example, such as manning OPs or road blocks.
5. Transcribe, collate and write up the data in the data base format.
6. Circulate to members of the focus group for review and comment.

7. Incorporate comments and finalize data base entries.
8. Repeat for a second group from another battalion to conform reliability of data.
9. Use the same SME group(s) to review likely sources of descriptive, pictorial or video information for suitable excerpts.
10. Identify areas of uncertainty, incomplete information or contradiction for more detailed study on appropriate exercises or operations.

This approach should ensure the maximum use of the pool of operational experience already existing in the Canadian forces to ensure realism and relevance to user needs.

7.2.3 Training exercise or operational data

Past experience in gathering data from direct observation of soldiers performing representative tasks under operational or training conditions has resulted in this approach, per se, being rejected as the primary method of acquiring data for this data base. The approach is expensive and cumbersome in scientific and management terms and unlikely to succeed. For example: it would be difficult and expensive to gather data directly during training in Canada on typical riflemen's tasks representative of U.N. duties. Furthermore, any data gathered during training (unless the training exercise is dedicated to data gathering under controlled conditions) is unlikely to be a valid representation of operational demands in a number of ways. For instance, training is seldom conducted over the same duration or with the same pauses or opportunities for preparation as real operations, equipment and manning levels differ, motivation levels vary, interaction with the civilian population is different.

Notwithstanding these shortcomings, exercises could be chosen (or even set up) to permit gathering of well focused, relevant data to validate data gathered in other ways, or to supplement such data. The planning of each data gathering exercise would vary according to the data needed and a trial plan should be produced for each occasion. However, some general points can be specified which will increase the probability of gathering valid, complete and reliable data.

- Data gathering will include diaries of task durations, details of loads carried and the method of load carriage selected, and descriptions of task activities. Electronic data gathering devices will be used whenever this is practical and effective.
- Close liaison with units should be maintained and trade-offs determined to ensure willing cooperation by the unit by showing that participation would enhance existing training not detract from it. For example, participation by units in the project could provide access to scarce resources such as pyrotechnics, ammunition, specialized equipment and weapons, opportunities to review relevant kit from other NATO countries or even manufacturers, etc.
- Data gathering should be undertaken by human factors personnel assigned to the task and be present with the unit during training (or operations). It is particularly important that data gathering is not tacked on to the existing duties of a unit member. This approach has proven unsuccessful in providing representative, complete, valid, or reliable data. Army personnel are not trained to gather data and, quite naturally, view it as a lower priority than their operational duties. Consequently, the task is performed only as well as time available from other duties permits.

In any case, it is unlikely that operational data on individual rifleman tasks can be gathered by direct observation. Such an approach either requires exposing additional personnel to the risks inherent in operational conditions (where they could require protection or just get in the way) or adds the task of gathering data to the workload of personnel performing the operational tasks in question. A more effective approach might be to debrief soldiers at a central location such as company or battalion HQ

directly after completing assignments such as road blocks, foot or vehicle patrols, or convoy escorts. In this way, in combination with records of other, routine daily field activities a more generic record of the pattern of activities in a small unit over several days could be achieved. Such an approach would also serve during training exercises.

7.2.4 Personal Data Assistants (PDAs)

Electronic Personal Data Assistants (PDAs) are being evaluated for their potential to assist with data gathering and this potential is documented in a separate report. In summary, despite their current technical limitations, the use of PDAs could be to help standardize data gathering during focus groups and de-briefings following exercises or operations. It is unlikely that PDAs would be useful to issue on a large scale to military personnel to facilitate data gathering by direct observation. Two key factors in this regard are the need for observers with the ability to judge which data to enter and the availability of military personnel to perform such a task during operations or training. However, experimentation with PDAs on a small scale should be pursued.

8. Data Acquisition Plan

Based on the outline above, data acquisition has been planned in two phases.

Phase IIIa: Data acquisition framework

Objectives: To detail the framework for menu items and data collection in Phase IIIb.
To identify key data related documents and sources for multi-media data.
To specify standard formats for data acquisition, conversion, entry and archiving originals.

Note:
Data format standards *will specify the format for data to be entered into each cell within the data base. Checklists would specify requirements for each data cell within a data category. For example, data items for the in-service clothing category might include official title, colloquial title, NATO stock number(s), size ranges, sketch or photograph of each item, technical specification, intended use, year of acceptance for in service use, numbers in stock, numbers procured annually, tasks associated with use and maintenance, etc.*

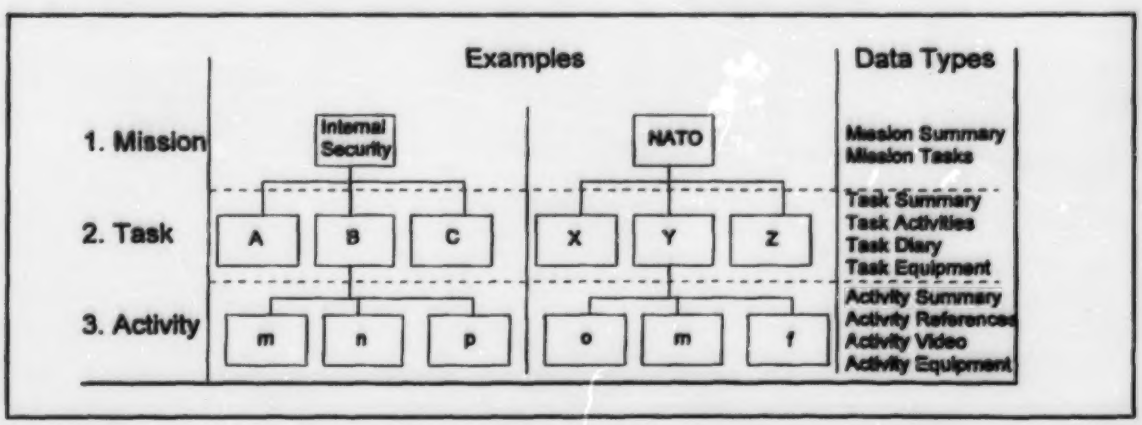
To fulfill the objectives for this Phase, the tasks outlined under the three headings below will need to be completed.

1. **Clothing, equipment, weapons**

   Conduct SME focus group at DLR to identify documentary data references.
   Provide data acquisition checklist, data format standards, and work plan for acquisition and entry of related data items.

2. **Missions, tasks, activities**

   Conduct SME focus group at DLR to identify documentary data references.
   Outline infantry tasks involved in missions which Canadian infantry units might be called on to perform. Phase IIIa work would outline the structure for levels 1 and 2 (Mission and Task) depicted below. Phase IIIb work would complete data gathering for all three data levels (mission, task, activity).



Provide an outline program and work plan for acquisition and entry of related data items using SME focus groups at infantry units and, subsequently, measurement and observation during training exercises or operations.

3. **Literature references and visual data items**

   Identify sources of visual data on infantry tasks (video or film clips, and photographs) and appropriate contact persons. Obtain catalogues of visual data, if available.

   Undertake a literature search for relevant descriptive (operational diaries, etc.) or technical studies (field trials) based on the output from work items 1 and 2 above.
   Provide a detailed format, checklist and work plan for acquisition and entry of related data items.

Phase IIIb: Detailed data acquisition

Objective: To acquire and enter data outlined in Phase IIIa.

1. **Clothing, equipment, weapons**

   Acquire multi-media data in hard copy or electronic form according to checklist developed in Phase IIIa.
   Follow data format standards developed in Phase IIIa to configure data to data base format
   Enter data into data base.
   Cross reference data to other bibliographic and task related entries.
   Archive original data.

2. **Missions, tasks, activities**

   a) Undertake program of SME focus groups with infantry units to confirm mission tasks, and to determine task activities required to fulfill them.
      Capture relevant data.
      Convert and enter into the data base.
      Identify key data items or omissions for further study during training or operations
      Identify opportunities for gathering data during training or operations.

   b) Undertake program of SME focus groups with infantry units to estimate frequency and duration data for key tasks and activities.
      Capture relevant data, convert and enter into the data base.
      Source multi-media data for key tasks (video, photographs, etc.).

   c) Develop workplans for gathering data during training or operations (task or activity frequencies, multi-media, etc.).
      Capture relevant data, convert and enter into the data base.

3. **Literature references and visual data items**

   Review literature references captured during Phase IIIa.
   Flag potential data items within literature references (tables, graphs, pictures) for future inclusion in data base.
   Prepare cross references to other data base items.
   Enter bibliographic reference for relevant studies in data base.
   Cross reference bibliographic entry to other data base items.
   File literature references.

9. Data Updating

A constant characteristic of any data set of this nature is that it will always be changing. Equipment and weapons will be replaced, operational doctrines will change, unit organizations will be modified, new studies on task demands will appear. If this data base is to remain current there needs to be a systematic method and allocation of resources for reviewing a range of data sources for new information, and incorporation of relevant changes into the data base. Database updates will probably need to be undertaken every one or two years. Once the data base has been extended to other arms, then a rotational updating system will probably be needed. Data format standards and data acquisition approaches to be used for data updating should be based on those shown to be effective during Phase III. Once data acquisition is well advanced, a specific plan for updating key data categories in the data base will need to be written.

10. Summary

In summary, the purpose of this project is to provide information that will improve insight into the military world for outsiders involved in the procurement process. In the first instance the primary focus will be clothing and equipment involved in the IPCE project. The term "outsiders" includes civil servants and defence scientists working within DND as well as potential contractors in industry and universities. Even within the military, there is a need to ensure that special to arm needs can be anticipated and recognized by other arm specialists acting as project managers.

The required information falls under two headings:

- Existing documents such as listings and descriptions of in-service garments, organizational structure of different units.
- Data about activities undertaken by soldiers using the garments (weapons, equipment, etc.) for different operations under different conditions and the consequent demands placed on soldiers. This may exist in the memory of experienced service personnel, as operational reports or unit diaries, or in technical reports on field studies.

For both categories, much information already exists but in differing forms and widely dispersed. Therefore the problem is perceived as one of first finding and then selecting the appropriate information, verifying its relevance and accuracy, providing some form of independent validation preferably using operational or field data, and supplementing it with appropriate details where gaps are identified.

To satisfy these requirements as economically as possible using the data sources outlined above the general strategy will be to use a "waterfall" approach. By this we mean, for each area of interest, a systematic transition from the use of inexpensive and already available information screened and selected by focus groups of Subject Matter Experts (SME's) through to standardized derivations of operational scenarios generated by further focus groups of SME's through to data gathering on operations or during training exercises of critical information for validation or to fill existing information gaps.

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14. ABSTRACT

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15. KEYWORDS, DESCRIPTORS or IDENTIFIERS

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